**Continuous Time and Temporally Constrained Tour Pattern Generation System for**

**Jointly Modeling Daily Tours and Stops: Application of Bi-level**

**Multiple Discrete Continuous Probit Model**

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The primary objective of the current paper is to contribute to the literature on activity pattern generation. In this research, a new framework is proposed to simultaneously model the following tour and stop making decisions: the number and purpose of tours conducted on a day, time allocated to different tours, the number and purpose of stops conducted within each tour, and time allocated to different stops. The framework represents time as a continuous entity and explicitly considers the time constraints within which an individual operates when generating tours and stops. Additionally, the framework is capable of accounting for the interrelationships across different tour- and stop-level decisions. The model formulation that operationalize the proposed framework imitates a bi-level structure where the participation (whether to pursue?) and time allocation (how much time?) decisions to daily tours are modeled at the upper level. Within each participated tour, participation and time allocation decisions for different stops are modeled at the lower level. The model formulation for the bi-level structure builds on the utility theoretic multiple discrete continuous probit (MDCP) modeling approach. The proposed framework and model formulation are demonstrated using an empirical case study employing data from the 2008-2009 National Household Travel Survey. Replication and forecasting results are presented to demonstrate the feasibility and applicability of the proposed framework and model formulation. The results provide evidence in support of the bi-level structure and its ability to reasonably capture the various constraints and interrelationships across tour- and stop-level participation and time allocation decisions.